

HAMPDEN COUNTY
WESTFIELD, MASSACHUSETTS

STEVENS PAPER COMPANY (UPPER) DAM
MA-00075

NATIONAL DAM INSPECTION PROGRAM
CORPS OF ENGINEERS

The original **hardcopy** version of this report
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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE June 1979
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18. SUPPLEMENTARY NOTES Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Hampden County Westfield, Massachusetts		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Stevens Paper Co. (Upper) Dam - MA 00075 has been found to have a "low" hazard potential. Based on sketches contained in the state inspection reports, the dam consists of a stone masonry spillway 150 feet long and a maximum height of 18 feet near the right abutment. The average height of the spillway is approximately 15 feet.		



environmental engineers, scientists,
planners, & management consultants

CAMP DRESSER & McKEE INC.

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Boston, Massachusetts 02108
617 742-5151

June 21, 1979

New England Division
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, MA 02154

Attention: Mr. E.P. Gould, Project Manager

National Dam Inspection Program
Contract No. DACW 33-79-C-0053

Gentlemen:

As a result of a site visit conducted on June 18, 1979, the Stevens Paper Co. (Upper) Dam - MA 00075 has been found to have a "low" hazard potential. This brief letter report documenting the determination of a "low" hazard potential classification of the dam is submitted in lieu of a complete Phase I Investigation Report.

Based on sketches contained in the state inspection reports, included herein, Stevens Paper Co. (Upper) Dam consists of a stone masonry spillway 150 feet long and a maximum height of 18 feet near the right abutment. The average height of the spillway is approximately 15 feet. The abutment walls and embankments rise 8 feet above the spillway crest on both banks. The dam, which has a 1901 date on its southwesterly abutment, impounds the water of the Little River in the City of Westfield, Mass. The dam was originally constructed to provide water power to the adjacent mill. The mill was not in operation at the time of the site visit.

Based on Corps of Engineers Guidelines for Estimating Dam Failure Hydrographs, and assuming that a failure would occur along 40 percent of the length of the dam structure, the peak dry weather flow (pool at spillway crest) is estimated to be 5,860 cfs and the peak wet weather flow (pool at top of dam) is estimated to be 19,280 cfs. The dry weather failure flow is less than the 10-year frequency flood presented in the Flood Insurance Study (FIS) for the City of Westfield, and no significant hazard is associated with such an event. The estimated wet weather failure flow is about equal to the 100-year flood of 18,300 cfs. The base flood which would result in a pool elevation at top of dam is equal to the 50-year flood. The hazard classification, therefore, depends on the increase in hazard, or lack thereof, between discharges equivalent to the 50-year and 100-year floods peaks.

New England Division
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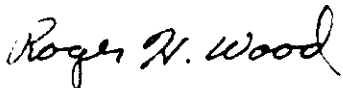
According to the FIS Flood Boundary Maps, no developed areas are affected by the 100-year flood between the Upper and Lower Stevens Co. Dams, a reach length of 1.3 miles. Crane Pond is formed by the Lower Stevens Co. Dam and would experience a surge as a result of a failure of the Upper Stevens Dam. However, assuming no reduction in the failure outflow in the 1.3 mile reach, a 5 foot freeboard would remain at the lower dam. Downstream of the Lower Stevens Dam is an extensive, underdeveloped flood plain which would attenuate any surge which might pass through Crane Pond.

The foregoing analysis considered a dam failure flow based on the downstream hydraulic height of the dam (downstream toe of dam to top of dam abutments). It should be noted that the enclosed profile presented in the FIS indicates that the upstream pool above the dam is almost totally silted in. This condition is exhibited in photographs 4 and 6. Consequently, a dam failure flow of 19,280 cfs is extremely conservative as there is essentially no dead storage in the upstream pool.

As there is no apparent increase in hazard above that which would exist prior to failure, the hazard potential of the Upper Stevens Dam is considered low. Based on this finding, the Phase I assessment of the condition of the dam has not been performed.

Very truly yours,

CAMP DRESSER & McKEE INC.



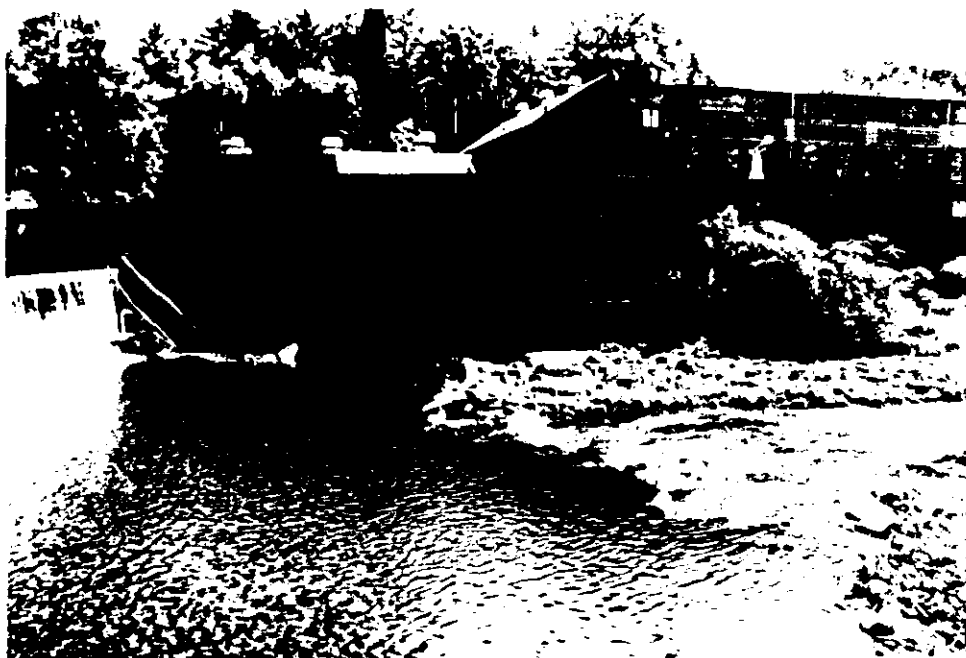
Roger H. Wood, Vice President

RHW/je

Enclosures



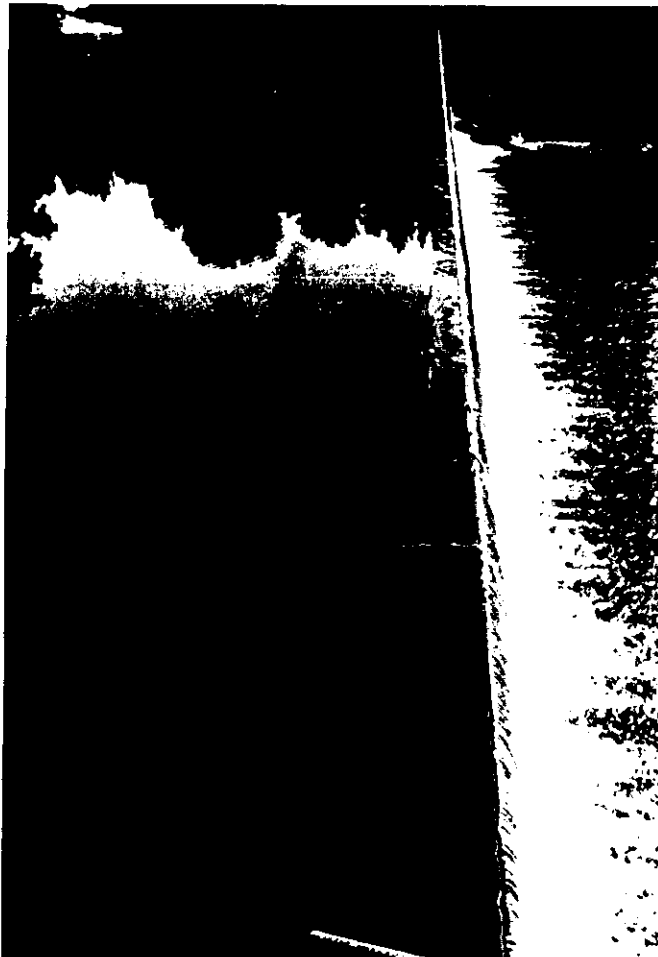
1. Overview of dam from downstream right abutment. Portion of Hortons Bridge located upstream of dam is shown in background.



2. View of mill on downstream left bank.



3. Downstream channel from right abutment.



4. View of spillway crest from right abutment. Note shallow depth of upstream pool.



5. View of Little River downstream of Hortons Bridge. The dam and adjacent mill are shown at top of photograph.



6. View of Little River looking upstream from Hortons Bridge. Note shallow depth of upstream pool.



7. View of Crane Pond from Lower Stevens Dam left abutment.



8. View of Lower Stevens Dam and adjacent mill from Southwick Road Bridge.

150' wide stone masonry dam across Little River

Height varies from 12 ft. on east bank to 18 ft. on west bank at downstream face.

Abutment height above spillway crest is 8 ft.

Elevations

Spillway crest: 151.8

Abutment elev.: 157.8

Top of spillway: varies from 152.8 to 163.8

DRY WEATHER FAILURE ie: water at spillway crest

$$Q_p = 8/27 W_b \sqrt{g} (Y_o)^{3/2} ; W_b = 40\% \times 150' = 60'$$

$$Y_o = 151.8 - (152.8 + 153.8)/2 = 15'$$

$$Q_p = 8/27 \times 60 \times (32.2)^{.5} (15)^{1.5} = 5,860 \text{ cfs}$$

from Flood Insurance Study (FIS) for the City of Westfield, the 10-YR frequency flood in the Little River at Upper Stevens Dam is 6,400 cfs. \therefore 5,860 cfs would not present any significant hazard.

WET WEATHER FAILURE ie: water at top of dam

Flow over spillway prior to failure = $4.0 \times 150 \times (8)^{1.5} = 13,580 \text{ cfs}$
which is equal to the 50-YR flood in FIS

$$\text{Failure flow} = 8/27 \times 60 \times (32.2)^{.5} (23)^{1.5} + 13,580 \times 60\%$$

$$= 11,130 + 8,150 = 19,280$$

$$\text{Increase due to failure} = 19,280 - 13,580 = 5,700 \text{ cfs}$$

100-YR flood flow = 18,300 cfs, from FIS, which almost equals Failure flow of 19,280 cfs

From FIS Flood Boundary Maps, no developed areas are affected by the 100-YR flood between the Upper and Lower Stevens Dams, a reach length of 1.3 miles.

Field inspection of the Lower Stevens Dam found an abutment height of 15 ft. between spillway crest and top of dam.

The FIS indicates the head on the Lower Dam at 100YR flow (18,200 cfs @ dam) is ~9 ft. and at 500YR flow (35,000 cfs @ dam) is ~13 ft.

Therefore, the dam failure surcharge of 5,700 cfs from 13,500 cfs to 19,200 cfs will not cause the dam to be overtopped.

Inspection of the 100-YR flood plain between the Lower Stevens Dam and the Penn Central R.R. crossing, approx. 1.5 miles downstream, indicates more than adequate surcharge-storage to attenuate the dam failure surge that would pass the Lower Dam. The industrial buildings which are located along Ponders Hollow Rd. within the 100-yr. flood plain adjacent to the Penn Central R.R. would not be significantly flooded over and above what would be experienced due to the natural flood prior to the dam failure.

It is noted that the foregoing analysis assumes that the failure of Upper Stevens Dam would involve the full hydrostatic height of the structure ($y_0 = 45'$). However, field surveyed cross sections obtained during the FIS and verified by field inspection show that upstream pool is completely silted in with a maximum water depth below spillway crest of 6 ft. Therefore the above dam failure flow is considered conservative.

It is therefore concluded that a wet weather failure of the Upper Stevens Dam would not increase the downstream hazard beyond that which existed immediately prior to the failure.

3.2 Hydrologic Analyses (continued)

Table 1b
Discharge-Frequency Relationships
Little River at Westfield, Mass.

<u>Location</u>	<u>Drainage Area Square Miles</u>	<u>Discharge-cfs*</u>			
		<u>10 yrs</u>	<u>50 yrs</u>	<u>100 yrs</u>	<u>500 yrs</u>
Above mouth	84.0	6,800	14,600	19,300	35,900
Above lower dam	81.0	6,600	14,200	18,900	35,000
Above upper dam	77.7	6,400	13,800	18,300	34,000
Above Munn Brook	56.5	5,100	11,100	14,700	27,200

- E Discharge-frequency relationships for the remaining watercourses which were studied in the city of Westfield were developed by regional-frequency analysis (Reference 11) and routed by standard methods to the study areas. Adopted flows for the watercourses are listed in Table 1c.

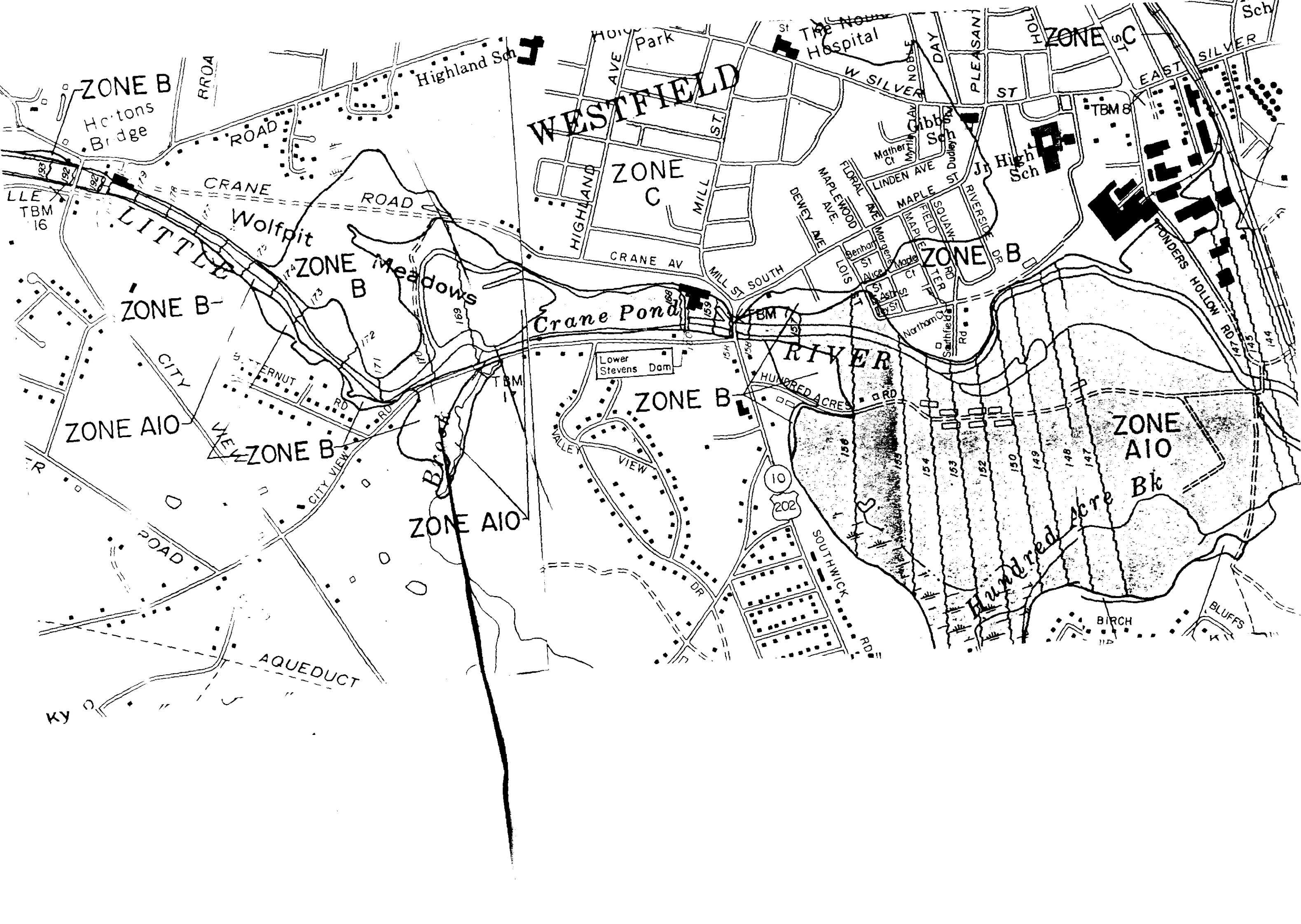
Table 1c
Discharge-Frequency Relationships
Great, Powdermill, and Munn Brooks, Westfield, Mass.

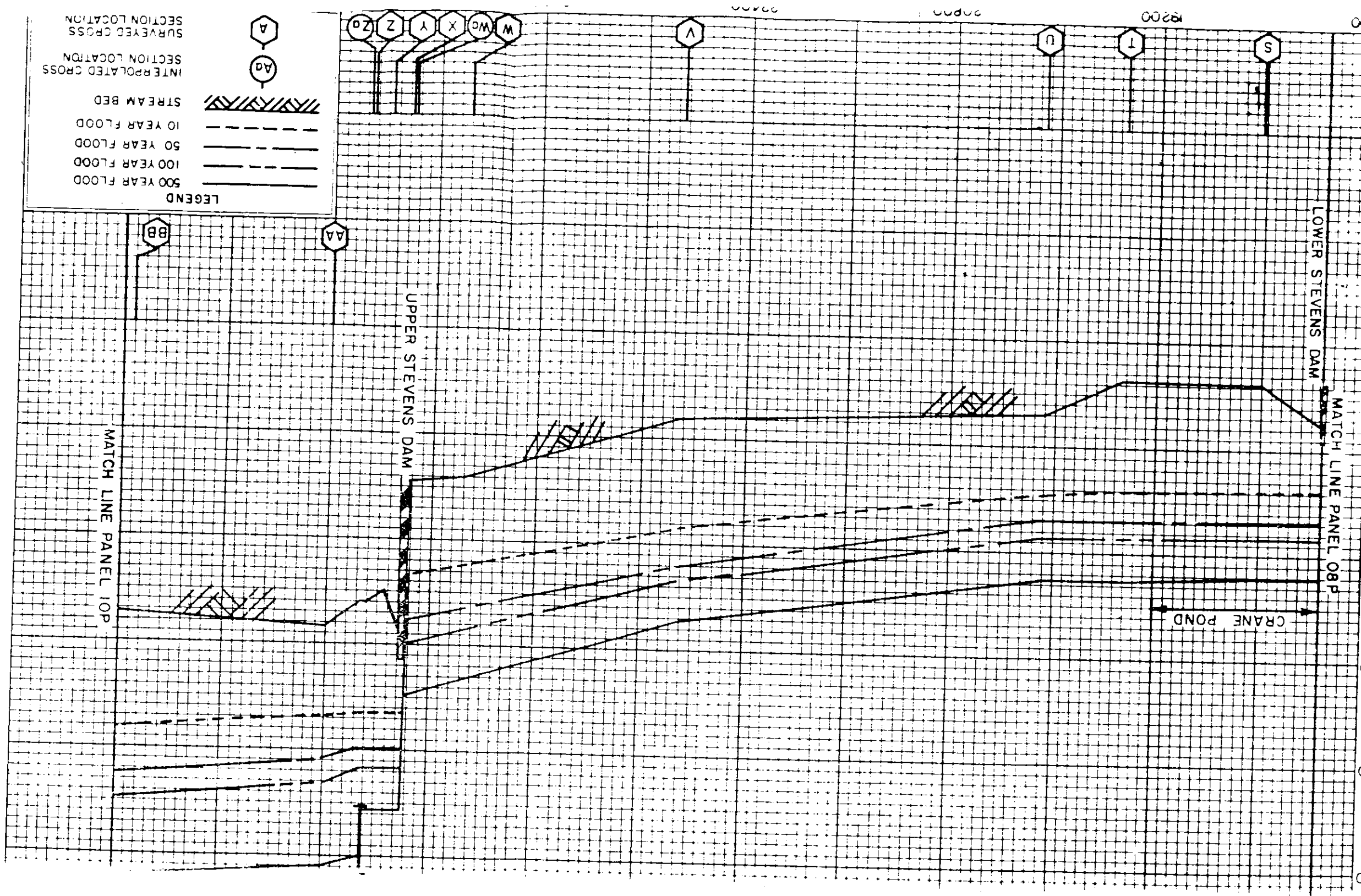
<u>Location</u>	<u>Drainage Area Square Miles</u>	<u>Discharge-cfs*</u>			
		<u>10 yrs</u>	<u>50 yrs</u>	<u>100 yrs</u>	<u>500 yrs</u>
Great Brook	24.7	600	900	1,000	1,300
Powdermill Brook	19.1	75	750	1,000	1,400
Munn Brook	21.7	1,300	2,200	2,600	3,700

3.3 Hydraulic Analyses

- A Hydraulic characteristics of watercourses in the city of Westfield were analyzed, to estimate flood elevations of the selected recurrence intervals along each watercourse studied in detail.
- B Water-surface elevations for floods of the selected recurrence intervals were computed using the U.S. Army Corps of Engineers HEC-2 step-backwater computer program (References 12, 13, and 14). Cross sections for backwater analyses of watercourses studied in detail were field surveyed at specific locations

*Cubic Feet Per Second.





1. LOCATION:

City/~~Box~~ Westfield . County Hampden . Dam No. 2-7-329-6 .

Name of Dam Stevens Paper Company - Upper Dam .

Mass. Rect.

Topo Sheet No. 9D . Coordinates: N 410,600 , E 251,000 .

Inspected by: Russell C. Salls, P.E. On Dec. 10, 1973 . Date June, Last Inspection 1970 .

See also Dam Number 2-7-329-5

2.

OWNER/S: As of December, 1973

per: Assessors _____, Reg. of Deeds _____, Prev. Insp. _____, Per. Contact X .

1. Stevens Paper Mills, Inc., Windsor, Connecticut 06095

Name	St. & No.	City/Town	State	Tel. No.
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2. _____	_____	_____	_____	_____
Name	St. & No.	City/Town	State	Tel. No.

3. _____	_____	_____	_____	_____
Name	St. & No.	City/Town	State	Tel. No.

3.

CARETAKER: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Mr. Robert Ray, Plant Engineer

c/o Stevens Paper Mills, Inc., 77 Mill Street, Westfield, Ma. 01085 562-2315

Name	St. & No.	City/Town	State	Tel. No.
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4.

DATA:

No. of Pictures Taken None . Sketches See description of Dam.
Plans, Where None found.

5.

DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor X . 3. Severe _____ .

2. Moderate _____ . 4. Disastrous _____ .

Comments: Large undeveloped flood plain below dam before river reaches Lower Dam.
Number 2-7-329-5.

*This rating may change as land use changes (future development).

No. 1 Location and Type: drop varies 12' to 18' spillway -
Flashboard stanchions bent - some missing -
Controls Yes, TYPE: no flashboard.
Automatic . Manual X. Operative Yes , No X.
Comments: Exposed red stone ledge in area at base wall
4' diameter # boiler plate drawdown 10' from east end
No. 2 Location and Type: through base spillway wall.
Slide gate, rack and pinion mechanism -
Controls Yes, Type: remotely operated.
Automatic . Manual X. Operative Yes , No X.
Gate covered with silt, etc. by floods. Stem of remote operating
Comments: mechanism bent out - bearing removed - inoperative.
Just upstream dam easterly side river - intake chamber for
No. 3 Location and Type: former power penstock - now intake for water used by
Mill.
Controls Yes, Type: Control wheel on deck for gate - additional gates
in Mill.
Automatic . Manual X. Operative Yes X, No .
Mill Maintenance Supervisor Kellogg said gates in Mill
Comments: operated recently.
Drawdown present Yes X, No . Operative Yes , No X.
Comments: See No. 2 Above.

7. DAM UPSTREAM FACE: Slope Unknown, Depth Water at Dam 6'.
Material: Turf . Brush & Trees . Rock fill X. ^{Stone} Masonry X. Wood .
Other Back spillway wall under water assumed to be stone masonry.
Condition: 1. Good X. 3. Major Repairs .
2. Minor Repairs . 4. Urgent Repairs .
Comments: Under water - conditions assumed.

8. DAM DOWNSTREAM FACE: Slope 1 in 6 Batter - 8" to foot. ^{Cut stone on crest overhangs}
Material: Turf . Brush & Trees . Rock Fill . ^{Stone} Masonry X. Wood .
Other .
Condition: 1. Good X. 3. Major Repairs .
2. Minor Repairs . 4. Urgent Repairs .
Comments: Unable to inspect spillway wall and toe due to 4 to 6 inches of water flowing
over wall. Wall apparently founded on red ledge. Noted three small boils
100' downstream.

Width _____ Ft. Height _____ Ft. Material _____

Condition: 1. Good _____ 3. Major Repairs _____

2. Minor Repairs _____ 4. Urgent Repairs _____

Comments: Flood training wall on east side built in 1957 to prevent water
from flowing through Mill Yard and Mill.

10.

WATER LEVEL AT TIME OF INSPECTION: 1/3 Ft. Above X Below _____

Top Dam X F.L. Principal Spillway _____

Other _____

Normal Freeboard 8' 1" west bank
12' 1" east bank

11.

SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment None

Animal Burrows and Washouts None

Damage to Slopes or Top of Dam Slight wear of masonry of abutment at crest of spillway.

Cracked or Damaged Masonry None seen

Evidence of Seepage None noted

Evidence of Piping Three very small "tea cup size" boils about 100 ft. downstream on easterly side of river.

Leaks None noted

Erosion None noted

Trash and/or Debris Impeding Flow Some logs on crest spillway

Clogged or Blocked Spillway Drawdown gate inoperative and covered with silt, sand and gravel by floods.

Other _____

12.

OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed_____X_____.
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)
Recommend removal from inspection list_____.

13.

REMARKS AND RECOMMENDATIONS: (Fully Explain)

This is an old stone masonry spillway dam with a 1901 date on its southwesterly abutment. It originally provided water power to the adjacent Mill but now the Upper Mill is using the old penstock to draw water for processing and fire protection and the old turbine pit is closed off.

According to the Mill Maintenance Supervisor the control at the penstock inlet has not been operated for some time but control valves and gates inside the Mill are operating. The penstock entry chamber is covered with a plank deck with the hand wheel controlling the intake gate projecting above it. Close inspection of the intake was not practical. There is a steel bar trash rack on the river side of the entry chamber.

In 1957 a concrete flood training wall was built on top of the old stone abutment wall on the northeasterly end of the dam with a leg extending into the slope to present flooding of the Mill and Mill Yard. At this time the shaft for the remote control for the drawdown gate in a recess in the abutment wall was forced outward making it inoperative. The concrete wall and stone masonry abutment are in good condition.

The old four foot diameter drawdown conduit through the base of the stone masonry spillway wall about ten feet from the east end was visible on the downstream face. Silt and other debris covered the upstream end and the gate. The Plant Maintenance Supervisor said that the gate was originally operated by a rack and pinion arrangement located under the water at the gate. The pinion was turned by means of a hand wheel located on the abutment through a system of gears. This drawdown has not been opened for years and the operating mechanism is inoperative.

RCS/js/sd

The alignment and grade of spillway structure and the abutments were true with no visible sags or bulges and no loose or missing stones noted. It appears to be built on red sand stone ledge.

About 100 feet downstream of the dam on the easterly side of the river, three small boils about the size of a tea cup were noted. These were pointed out to the Maintenance Supervisor and the Assistant Factory Manager. It is suggested that a close watch of these boils be maintained.

RCS/sd

Date December 10, 1973

City/~~Rox~~ Westfield

Name of Dam Stevens Paper Company -
Upper Dam

1. Location: Topo Sheet No. 99 Mass. Rect. Coordinates N 410,600 E 251,000
Provide $8\frac{1}{2}$ " x 11" in clear copy of topo map with location of Dam clearly indicated.
On Little River at Hortons Bridge - Granville Road, one mile from Western
Avenue, 300 ft. east of bridge.
2. Year built Unknown - but 1901 Year/s of subsequent repairs 1956 - Flood training
abutment. wall on south side.
3. Purpose of Dam: Water Supply For Mill Recreational X
Flood Control Irrigation Other Formerly used for
water power.
4. Drainage Area: in excess - 48 sq. mi. acres.
Type: City, Bus. & Ind. Dense Res. Suburban Rural, Farm 10%
Wood & Scrub Land 90% Slope: Steep 20% Med. 60% Slight 20%
5. Normal Ponding Area: 17 Acres; Ave. Depth 3 to 4
Impoundment: 22.2 Million gals.; 68 acre ft.
Silted in: Yes X No Approx. Amount Storage Area 40%
6. No. and type of dwellings located adjacent to pond or reservoir
i.e. summer homes etc. 8 to 12 full time residences plus Paper Mill.
7. Dimensions of Dam: Length 150 ft. Max. Height 18 ft.
8 ft. on west end.
Freeboard 12 1/2 ft. on east end.
Slopes: Upstream Face Unknown - under water.
Downstream Face Appears to be 1 in 4 batter.
Width across top 6' - cut stone crest.

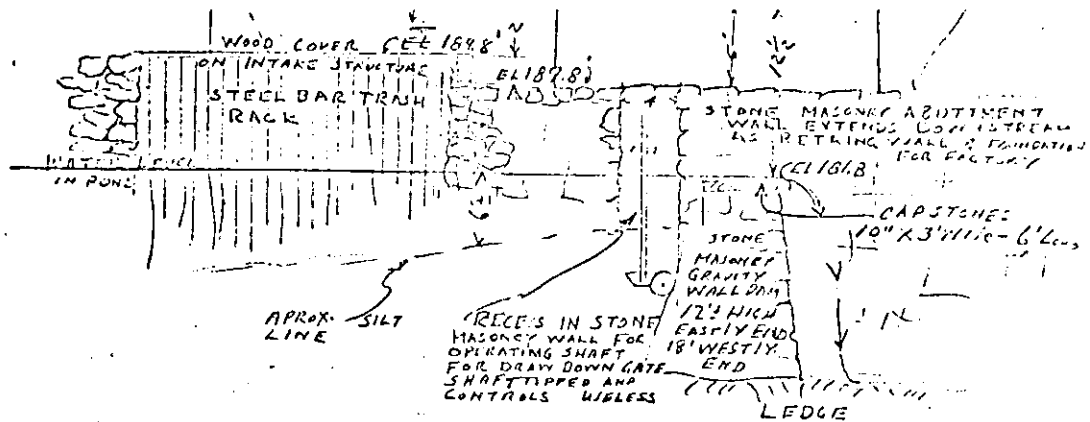
Timber _____ Rockfill _____ Other _____
8A. Dam Type: Gravity X Straight X Curved, Arched _____ Other _____
Overflow X Non-overflow _____

9. A. Description of present land usage downstream of dam:
80 % rural; 20 % urban
B. Is there a storage area or flood plain downstream of dam which
could accommodate the impoundment in the event of a complete
dam failure? Yes X No _____
C. Character Downstream Valley: Narrow _____ Wide X Developed 20%
Rural 80% Urban _____

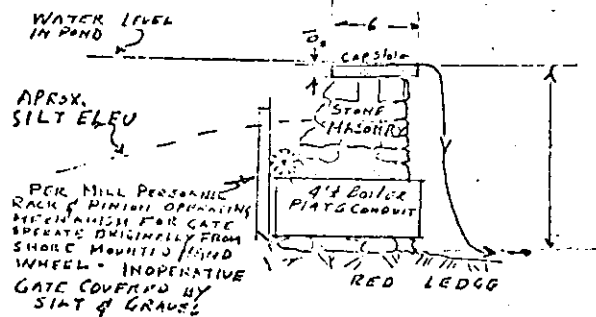
10. Risk to life and property in event of complete failure.
No. of people 1
No. of homes 1
No. of businesses None
No. of industries 1 Type Lower Stevens Paper Mill
No. of utilities 4 Type Telephone, Electrical, Water and Gas Distribution Line
Railroads None
Other dams Stevens Paper Company - Lower Dam, Number 2-7-329-5
Other Increasing development on low area near junction of Little and Westfield Rivers.

11. Attach Sketch of dam to this form showing section and plan on 8 $\frac{1}{2}$ " x 11" sheet.

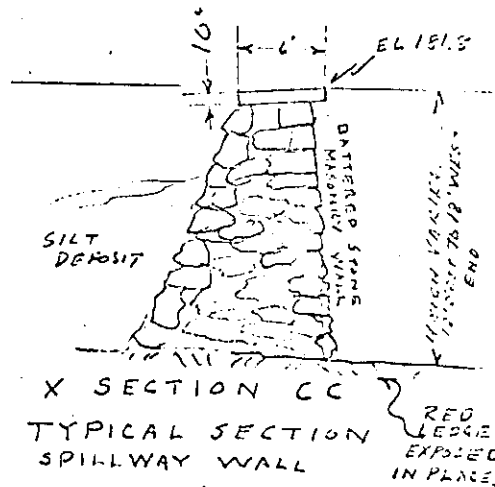
RCS/vk /sd
Attachments
Locus Plan
Sketches



X SECTION AA - SHOWING EAST ABUTMENT & INTAKE FOR MILL



X SECTION BB - THRU 4" DRAW DOWN CONDUIT - 10'± FROM EAST END DAM



X SECTION CC
TYPICAL SECTION
SPILLWAY WALL

